4.0 ENVIRONMENTAL IMPACTS

4.1 IMPACTS ON PHYSIOGRAPHY/GEOLOGY/AIR QUALITY/ SOILS

The initial construction and erection of the transmission line structures would require some disturbance and removal of small amounts of near-surface material, but no major impacts to either geologic resources or physiographic features would be anticipated. The soils of the study area would also be minimally impacted. The primary impact would occur with the construction phase of the project. An increased potential for erosion and soil compaction would occur as large equipment is used to install the transmission line. Clearing of the ROW, in the few areas where necessary, could decrease vegetative cover and increase erosion; while extended and continued use of large equipment could compact the soil. Natural revegetation would occur in undisturbed areas affected by construction efforts; farming activities could resume in agricultural/cropland areas.

Although much of the study area is composed of prime farmland soils, minimal impact to these soils would be expected. Alternative Routes A and B would cross areas of prime farmland soils. Construction-related erosion and compaction would occur; however, only small areas directly beneath the structures would be permanently removed from crop production. This would constitute a very small portion of the cropland/prime farmlands within the study area.

During construction of the proposed transmission line, air emissions would result from the operation of construction equipment and the generation of dust during construction activities. Construction equipment emits NO_x, VOC, CO, SO_2 and PM from the combustion of fuels. The movement of dirt produces dust or PM emissions to the air. It is expected that air contaminant emissions from construction activities would likely result in minor short-term impacts on air quality in the immediate vicinity of the project site, including increased levels of particulate matter and vehicular exhaust emissions. However, due to the relatively short duration of construction, long-term impacts would not be expected to adversely impact the air quality in the area.

4.1.1 No Action Alternative

Under this alternative, no impacts as a result of the project would occur. Changes to the soil would be limited to biological processes and changes in land use practices. Soil productivity would be affected naturally through leaching and weathering, but the effects would be negligible.

4.1.2 Applicant's Preferred Alternative (Route A)

Route A is the shorter of the two alternative routes (approximately 1,356.4 m or 4,450 ft) and crosses approximately 1,295.4 m (4,250 ft) of prime farmland soils. Construction-related erosion and compaction could occur but only very small areas (37.4 square meters (sq m) or 402.4 square feet (sq ft)) immediately

beneath the structures would be unavailable for use. Since the preferred route crosses no land currently used for farming, no prime farmland soils would be removed from crop production. The surface area of soil to be removed from potential production would include the area physically occupied by the structures plus any additional area removed from production as a result of limited access by farm equipment around the base of structures. The 2.8-ha (7-ac) converter station site would be permanently removed from crop production.

4.1.3 Route B

The general impacts would be similar to Route A except that Route B is longer (approximately 1,905 m or 6,250 ft) and crosses approximately 1,691.6 m (5,550 ft) of prime farmland soils (including 563.9 m (1,850 ft) of land currently used as cropland). Thus, impacts resulting from soil compaction, erosion, and loss of productivity would be greater than those from Route A, the bases of the structures taking up approximately 46.7 sq m, or 503 sq ft.

4.2 IMPACTS ON WATER RESOURCES

4.2.1 Surface Water

If the proposed transmission line is constructed, the surface water regime of the study area would remain almost unchanged from existing conditions; few impacts, if any, would be anticipated. Storm runoff, flow duration, low flow, and water quality characteristics should not experience any major alterations. Both alternatives must cross the Rio Grande. Additionally. both alternatives cross irrigation canals. All of these features are of a size and extent that can be spanned by the proposed project.

The main potential impact on surface waters from any major construction project is pollution resulting from erosion, and the accidental spillage of petroleum or other chemicals. Chemicals used during construction would include cleaners, paint, glues, etc. Electrical transformers and breakers at the converter station would use mineral oil. A sterilizing herbicide would be used on the converter station site for the control of weeds in and around the concrete slabs. Vegetation removal would likely be minimal, but could result in increased erosion potential of the affected areas, so that slightly higher-than-normal sediment yields could be delivered to drainages during a heavy rainfall. However, these short-term effects would likely be minor as a result of the relatively small area to be disturbed at any particular time and the short duration of the construction activities. A Storm Water Pollution Prevention Plan (SWPPP) would be prepared for the project, as required by the Texas Pollution Discharge and Elimination System (TPDES), and a Notice of Intent (NOI) would be filed with the TCEQ. Sharyland would use standard erosion-control measures (possibly including silt fences, hay bales, brush berms, etc.) to control erosion from construction areas that are adjacent to water bodies.

Alternative Routes A and B are located within the 100-year floodplain of the Rio Grande. Where it is necessary to locate transmission line structures within floodplains, they would be designed and

constructed so as not to impede the flow of any waterway or create any hazard during flooding, and be in compliance with IBWC requirements. These requirements include: minimum vertical clearances over levee crowns and the floodway design high water level; minimum horizontal distances from the toe of a levee and channel banks; and maintenance requirements for structures and ROW. Additional details of these requirements are included in the IBWC correspondence in Appendix A of this document. Construction activity in floodplains could result in erosion and sedimentation impacts, especially if flooding occurs during the construction period. Support structures and maintenance access routes in the floodplain should not significantly affect flooding if not located in obvious flood channels. Some scour may occur around structures if flood-flow depths and velocities become great enough. Careful siting of structures, however, should eliminate the possibility of significant scour. Neither Alternative Routes A or B are expected to have significant impacts on the function of the floodplains and no adverse effects from flooding to adjacent or downstream property owners would be anticipated.

4.2.1.1 No Action Alternative

Changes would be limited to biological and natural processes. Sedimentation as a result of soil disturbance through agricultural practices and natural erosion would continue. Effects would be negligible.

4.2.1.2 Applicant's Preferred Alternative (Route A)

Route A is the shorter of the two alternatives (approximately 1,356.4 m, or 4,450 ft). Therefore, this alternative would have less potential impact from pollution resulting from erosion or the accidental spillage of petroleum or other chemicals, than Route B. Route A would cross the lesser amount of 100-year floodplain (approximately 198.1 m, or 650 ft) and, therefore, would have less potential impact. It also crosses approximately 94.5 m (310 ft) of open water (river and canal).

4.2.1.3 Route B

Route B is approximately 1.3 times longer than Route A and thus would have more potential for impacts. It would cross approximately 457.2 m (1,500 ft) of 100-year floodplain and 155.5 m (510 ft) of open water (river and canal).

4.2.2 Groundwater

Potential impact on groundwater from construction activities associated with the project would possibly be contamination from the accidental spillage of petroleum products. Care would be exercised in the storage and handling of petroleum products, especially near waterways. The No Action Alternative would result in continued impacts from land-use activities and natural and biological processes. The relative impacts of Alternatives A and B would be similar in degree to those described for surface water, above.

4.2.3 Floodplain/Wetland Assessment

This assessment of potential floodplain/wetland effects of the proposed project is included in this EA in accordance with DOE requirements in 10 CFR 1022.

4.2.3.1 Project Description

The nature and purpose of the proposed project are described in sections 1 and 2. The FEMA-mapped floodplains in the vicinity of the proposed route and the area of floodplain that would be affected by the proposed project are shown in Figure 2-3 (map pocket). Some transmission towers may be located in the floodplain. The "high hazard area" of a floodplain is described in 10 CFR 1022 as "those portions of riverine and coastal floodplains nearest the source of flooding which are frequently flooded and where the likelihood of flood losses and adverse impacts on the natural and beneficial values served by floodplains is greatest." Tower emplacement is not expected to occur in high hazard areas.

4.2.3.2 Floodplain/Wetlands Effects

Actions that would affect the 100-year floodplain would be construction of support structures for transmission towers, if necessary. Should the need for floodplain construction be required, Sharyland would comply with the requirements of the IBWC. Construction activity in floodplains could result in erosion and sedimentation impacts, especially if flooding occurs during the construction period. Support structures and maintenance access routes in the floodplain should not significantly affect flooding if not located in obvious flood channels.

4.2.3.3 Alternatives

All of the land in the study area, adjacent to the Rio Grande River, contains floodplains. The locations of the proposed transmission towers are constrained by the connection points to transmission lines in Mexico, south of the Rio Grande River. Neither Alternative Routes A or B are expected to have significant impacts on the function of the floodplains and no adverse effects from flooding to adjacent or downstream property owners is anticipated.

4.3 IMPACTS ON TERRESTRIAL ECOSYSTEMS

4.3.1 Vegetation

The primary impact to vegetation resulting from site preparation and construction of the proposed transmission line would be the removal of existing woody vegetation or danger trees from the areas required for the ROW. The greatest amount of clearing of vegetation would be required in brushland and riparian woodland, while minimal clearing would be necessary in cropland or pastureland. Within cropland and pastureland, the ROW may be temporarily unavailable for cultivation or grazing during

construction. Once construction is completed, the ROW could be used as the landowner desires. The only land lost to cultivation would be that occurring immediately beneath the structures.

Very little native vegetation would be removed along either of the alternatives. The study area consists almost entirely of cultivated or developed land. Some native vegetation is extant; however, these areas would generally be avoided. Along the banks of the Rio Grande, any vegetation clearing would be done by hand to a height below that of the conductors.

Potential jurisdictional waters, which include hydric habitats associated with rivers, streams, canals, impoundments, and depressions, may also be impacted by construction of the transmission line. These areas would be spanned such that support structures would not be placed within sensitive hydric communities.

4.3.1.1 No Action Alternative

Species composition would continue to change slowly as a result of natural succession and from natural occurrences such as wildfires, floods, and disease. Species composition would change more rapidly through agricultural practices such as brush clearing.

4.3.1.2 Applicant's Preferred Alternative (Route A)

Route A would require very little clearing of vegetation, as it crosses no brushland/woodland or thornscrub, which provides habitat for the endangered ocelot and jaguarundi. It would also cross a water of the U.S. (Rio Grande). Since the average span distance between structures would be approximately 121.9 to 198.1 m (400 to 650 ft), the river would be spanned without placing structures in the jurisdictional area, thus minimizing potential impacts.

4.3.1.3 Route B

Route B would require some vegetation clearing (crossing approximately 73.2 m (240 ft) of brushland/ woodland) and would also cross a water of the U.S. (Rio Grande). The river would be spanned without placing structures in the jurisdictional area, thus minimizing potential impacts.

4.3.2 Endangered and Threatened Plant Species

As mentioned in Section 3.4.3, one federally endangered species, Walker's manioc, has been recorded from the study area. The approximate location of this species, in the southwest portion of the study area, could be equally close to both routes. Several other species, including the federally endangered Texas ayenia, have been recorded from Hidalgo County and are thus of potential occurrence in the study area. In all, three federally endangered plant species (Walker's manioc, star cactus, and Texas ayenia) and six federal SOCs have been recorded from Hidalgo County and, thus, are of potential occurrence within the alternative ROWs if suitable habitat occurs. The federal SOCs, however, have no legal federal protection

under the ESA. Field surveys during the time when these plant species are identifiable (usually during their flowering season) would reveal whether any populations occur within the ROW. If endangered plant species are found in areas that cannot be avoided during construction, individual plants could be fenced for protection or transplanted. No surveys for these species have been conducted within the proposed ROW.

4.3.3 Wildlife

The impacts of transmission lines on wildlife can be divided into short-term effects resulting from physical disturbance during construction and long-term effects resulting from habitat modification. The net effect on local wildlife of these two types of impacts is usually minor. A general discussion of the impacts of transmission line construction and operation on terrestrial wildlife ecology is presented below, followed by a discussion of the possible impact of each alternative route.

Clearing and construction would directly and/or indirectly affect most animals that reside or wander within the transmission line ROW. Heavy machinery could kill some small, low-mobility forms. These include several species of amphibians, reptiles, mammals and, if ROW clearing occurs during the breeding season, the young of many species including nestling and fledgling birds. Fossorial animals (i.e., those that live underground) could be negatively impacted as a result of soil compaction caused by heavy machinery. Larger, more-mobile species such as birds, coyotes, and squirrels would likely avoid the initial clearing and construction activities and move into adjacent areas outside the ROW. Wildlife in the immediate area could experience a slight loss of browse or forage material during construction; however, the prevalence of similar habitats in adjacent areas and re-growth of vegetation in the ROW following construction would minimize the effects of this loss.

The increased noise and activity levels during construction would potentially disturb breeding or other activities of species inhabiting the areas adjacent to the ROW. However, these impacts would be temporary. Although the normal behavior of some wildlife species would be disturbed during construction, little long-term damage to the populations of such organisms would be expected.

Once construction is completed and the vegetation recovers, most forms of wildlife would be expected to move back into the ROW. Periodic clearing, while producing largely temporary negative impacts to some wildlife, improves the habitat for ecotonal or edge species, such as the eastern cottontail, white-tailed deer, and northern bobwhite, with increased production of small shrubs, perennial forbs, and grasses.

Transmission line structures can benefit some bird species, particularly raptors, by providing nest sites and hunting perches. One of the more common species that uses such structures for nesting is the red-tailed hawk (*Buteo jamaicensis*). The greatest use, however, is for hunting perches (Olendorff, et al., 1981). The wires and structures could increase the number of roosting (or perching) sites over parts of the transmission line route for such species as the red-tailed hawk, American kestrel (*Falco sparverius*), mourning dove, loggerhead shrike, and meadowlarks (*Sturnella* spp.). The danger of electrocution to

birds would not be expected to be significant since the distance between conductors or conductor and structure or ground wire on 138-kV transmission lines is usually greater than the wingspan of any common bird in the area (i.e., greater than 1.8 m, or 6 ft).

The transmission line (both structures and wires) would present a hazard to flying birds, particularly migrants. During a workshop on impacts of transmission lines on birds in flight, it was concluded that mitigation may best be accomplished by the initial siting of transmission line routes (Avery, 1978). Because small birds such as passerines tend to migrate at lower altitudes than large birds (Tucker, 1975, cited by Gauthreaux, 1978), their potential for collisions should be greater. Most migrant species, however, including passerines, should be minimally affected during migration since their normal flying altitudes are greater than the heights of the proposed transmission structures (Willard, 1978; Gauthreaux, 1978). Large birds are more prone to collisions, because their large wingspans and lack of maneuverability make avoiding obstacles more difficult (Avian Power Line Interaction Committee (APLIC), 1994).

Collisions tend to increase in frequency during the fall when migrating flocks are denser and flight altitudes are lower in association with cold air masses, fog, and inclement weather. The greatest danger of mortality exists during periods of low ceiling, poor visibility, and drizzle, when birds are flying low, perhaps commencing or terminating a flight, and may have difficulty seeing obstructions. For resident birds or for birds during periods of non-migration, those most prone to collision are often the largest and most common in a given area (Rusz et al., 1986; APLIC, 1994). Resident birds, or those in an area for an extended period, learn the location of powerlines and become less susceptible to wire strikes (Avery, 1978). Raptors, typically, are uncommon victims of transmission line collisions due to their great visual acuity (Thompson, 1978). In addition, many raptors only become active after sufficient thermal currents develop, which is usually late in the morning when poor light is not a factor (Avery, 1978).

Powerlines within daily use areas are responsible for most bird collisions. Waterfowl species are vulnerable because of their low altitude flight and high speed. Species that travel in large flocks, such as blackbirds and many shorebirds, are also vulnerable, since dense flocks makes movement around obstacles more difficult for individuals in the flock (APLIC, 1994).

Several means can be employed to minimize transmission line impacts on birds in flight. The initial placement of a transmission line is the most important consideration (Avery, 1978; APLIC, 1994). The proximity of a transmission line to areas of frequent bird use is crucial. This is especially true for daily use areas (such as feeding areas) or other areas where birds may be taking off or landing regularly (APLIC, 1994). The position of the individual structures can also help reduce collisions. Faanes (1987), in an in-depth study in North Dakota, found that birds in flight tend to avoid the transmission line structures, presumably because such structures are visible from a distance; most appear to fly over the lines in the mid-span region. In areas where the transmission line passes between roosting and foraging areas, the

structures can be placed in the center of the flyway (i.e., where the birds are more likely to fly) to increase their visibility, in addition to heavily marking the wires.

The configuration of wires of a transmission line, including the ground wires, also should be considered. Faanes (1987) reported that 97% of birds observed colliding with a powerline did so with the ground wire, largely as a result of trying to avoid the conductors. Beaulaurier (1981) found that removal of the ground wire at two study sites in Oregon resulted in a reduction in collisions of 35% and 69%. Lines grouped more into a horizontal plane are generally better than lines grouped in a vertical plane (APLIC, 1994).

Increasing the visibility of the wires by using markers such as orange aviation balls, black-and-white ribbons or spiral vibration dampers, particularly at mid-span, has been shown to reduce the number of collisions. Beaulaurier (1981) reviewed 17 studies involving marking ground wires or conductors and found an average reduction in collisions of 45% compared to unmarked lines.

Waterfowl are among the birds most susceptible to wire strikes (Faanes, 1987) and yet, despite these hazards, it has been estimated that wire strikes (including lower voltage distribution lines) account for less than 0.1% of waterfowl non-hunting mortality, compared to 88% from diseases and poisoning and 7.4% due to the weather (Stout and Cornwell, 1976). In some areas, hunting affects 20 to 30% of waterfowl populations (Thompson, 1978).

In general, because vegetation provides habitat for wildlife, the preferred route from a vegetation standpoint is usually also the preferred route from a wildlife standpoint. In the study area, the greatest potential impact to wildlife would primarily result from the clearing of brushland/woodland habitat, having the ROW parallel and within 100 ft of canals/rivers, and crossing riparian areas and wetlands.

4.3.3.1 No Action Alternative

Impacts to wildlife would be limited to biological changes and changes resulting from continued agricultural and other land use practices. Any brush clearing that took place as a result of these activities would reduce habitat for certain species. Effects would be negligible.

4.3.3.2 Applicant's Preferred Alternative (Route A)

Route A traverses no brushland, woodland, or riparian habitats. Route A crosses approximately 94.5 m (310 ft) of open water; however, these areas would be spanned. In general, the longer the route the greater the potential impact for avian mortality through wire strikes. In this regard, Route A, being the shortest, is the preferred alternative.

4.3.3.3 Route B

The greatest diversity of wildlife species probably occurs in the brushland, woodland, and riparian habitat types. Route B crosses approximately 73.2 m (240 ft) of brushland/woodland and 155.5 m (510 ft) of open water. Again, these areas would be spanned, thus minimizing impacts.

Route B, being approximately 1,905 m (6,250 ft) in length, is the least desirable from an avian wirestrike perspective.

4.3.4 Endangered and Threatened Wildlife

No impacts to any of the endangered, threatened, or SOC avian species mentioned in Section 3.5.2.2 are anticipated. The federal SOC northern gray hawk, tropical parula, and loggerhead shrike, and the state-threatened zone-tailed hawk, northern beardless-tyrannulet, and rose-throated becard have been recorded within the study area (TXBCD, 2003; Sarkozi, 2002). Many of the listed species are unlikely to occur in the study area except as rare migrants or occasional visitors.

Of the non-avian species in Table 3-3, only the federally endangered jaguarundi and state-threatened river goby have been recorded from the study area (TXBCD, 2003). The federal SOC and state-threatened black-spotted newt, and the state-threatened sheep frog, South Texas siren, Texas indigo snake, and black-striped snake have been recorded from the vicinity of the study area (TXBCD, 2003). These, together with the subtropical blue-black tiger beetle, the Rio Grande lesser siren, the reticulate collared lizard, Texas horned lizard, Coues' rice rat, Mexican treefrog, white-lipped frog, Texas tortoise, speckled racer, and northern cat-eyed snake are typical of low-mobility forms that may be impacted during the initial clearing and construction phases of the project if the species should occur along the ROW. However, the likelihood of impact is minimal and short-term, and the project would not constitute a serious threat to any populations of these species.

The federally endangered jaguarundi has been reported from the study area (TXBCD, 2003) and records of the federally endangered ocelot are known from the vicinity of the study area. Photographs, carcasses, or trapped individuals have not supported these sightings; however, sufficient sightings from reliable observers exist to acknowledge these species' presence is possible. A jaguarundi was sighted in early 1993 by TPWD biologist Gary Waggerman on the FWS tract just south of the Anzalduas Dam, within the study area (Waggerman, 1994). In addition, both species have been reported from nearby Bentsen-Rio Grande State Park and Santa Ana NWR (outside the study area). According to the recovery plan for the ocelot and jaguarundi (FWS, 1990b), any area, except for human habitations, within a 16.1-km (10-mile) radius of an ocelot or jaguarundi occurrence is considered occupied habitat (i.e., the areas are considered to be occupied by ocelots/jaguarundis at some time of the year). The 16.1-km (10-mile) radius accommodates the known movement pattern of ocelots/jaguarundis. If the endangered cat sightings in the project area and vicinity are accurate, the entire study area, except for human habitations could be considered occupied habitat. In addition, a 16.1-km (10-mile) radius from Waggerman's 1993 jaguarundi

sighting would include the entire study area. Thus, any brushland tracts in the study area, particularly those within or adjacent to FWS refuge land or along the Rio Grande, are potential habitat for these two species. Even small patches of brushland habitat in the study area may provide temporary refuge for jaguarundis, and perhaps ocelots, dispersing between the few large tracts of native woodland and brushland still extant along the Rio Grande. During construction of the line, any jaguarundis or ocelots in the vicinity would likely avoid the areas of construction.

Potential habitat for these two endangered species in the study area, although limited in extent, was generally avoided when developing the routing alternatives. No potential brushland would be crossed by the Applicant's Preferred Route (Route A) and Route B crosses only 73.2 m (240 ft) of brushland, which would be spanned. Therefore, no long-term or permanent impacts to either the ocelot or jaguarundi are anticipated as a result of the project.

4.3.5 Critical Habitat

Since no designated critical habitat for any endangered or threatened species of plant or animal occurs in the study area, the proposed project would not impact critical habitat.

4.4 IMPACTS ON AQUATIC ECOSYSTEMS

The impact on aquatic flora and fauna is expected to be minimal. No major impact on fish or other aquatic organisms in the Rio Grande, canals or ponds as a result of the proposed action is anticipated, since these aquatic environments would generally be avoided or spanned. Impacts to be expected at the river, canal, and stream crossings are primarily those associated with temporary erosion and turbidity. The greatest potential for impacts to aquatic features are primarily from erosion in the vicinity of the river, canal, and stream crossings. Alteration of water quality as a result of particulate loading caused by direct mechanical damage from workers and equipment operating in streambeds, by clearing of riparian vegetation, and by siltation from erosion in newly disturbed areas, could also have effects on downstream areas. With appropriate erosion-control measures used during construction, these short-term effects would be expected to be minor as a result of the relatively small area to be disturbed at any particular time and the short duration of the construction activities. Similarly, while spillage of petroleum products directly into a water body could cause some minor temporary effects, careful construction practices would minimize this potential impact. No herbicides or other chemicals that might otherwise enter the aquatic system and negatively impact the aquatic communities would be used in association with the project. No impacts to any endangered or threatened aquatic flora or fauna would be anticipated. The applicant and its contractors would use standard erosion-control measures (including silt fences, hay bales, brush berms, etc.) to protect aquatic ecosystems during construction.

4.4.1 No Action Alternative

Changes would be limited to biological and natural processes. Sedimentation as a result of soil disturbance through agricultural practices, including vegetation removal in riparian areas, would continue. Effects would be negligible.

4.4.2 Applicant's Preferred Alternative (Route A)

Of the two alternatives, Route A has the least potential for aquatic impacts, although it would cross one water of the U.S. (Rio Grande). No potential wetlands would be crossed. It would also cross approximately 94.5 m (310 ft) of open water (river and canal). These areas would all be spanned.

4.4.3 Route B

Route B would cross one water of the U.S. (Rio Grande), but no potential wetlands. It would also cross approximately 155.5 m (510 ft) of open water (river and canal). These areas would all be spanned.

4.5 SOCIOECONOMIC IMPACTS

4.5.1 Socioeconomic Effects

For this project, minimal short-term local employment would be generated. Sharyland normally uses contractors during the clearing and construction phase of transmission line projects. A portion of the project wages would find their way into the local economy through purchases such as fuel, food, lodging, and possibly building materials. ROW easement payments would be made to individuals whose lands are crossed by the transmission line based on the appraised land value, and this would result in increased income to those landowners. Sharyland is also required to pay sales tax on purchases and is subject to paying local property tax on land or improvements. Since Sharyland would only require easements for the proposed line, none of this land would be taken off the tax rolls. The cost of permitting, designing, and constructing the line would be paid for through revenue generated by the sale of electrical service.

The transmission line portion of the project would employ two 4-man crews and one contract Crew Foreman. The converter station would have several different crews performing basic construction, as well as very specialized construction. These crews would construct the main building to house the converter unit, assemble the converter equipment, test the equipment, install security fencing, clean the premises and other basic construction tasks. There could potentially be as many as 20 workers on site at any time. The number of construction workers may vary according to work plan.

The proposed construction schedule calls for approximately 11 months of actual construction time on the converter station after all engineering and procurement is complete. Actual construction would likely start in June 2005 and be complete by May 2006. Work would progress throughout the year in all seasons.

Potential long-term economic benefits to the community resulting from construction of this project are based on the necessity for electric utilities to provide an adequate and reliable level of power throughout their service areas. Economic growth and development rely heavily on adequate public utilities, including a reliable electrical power supply. Without basic infrastructure a community's potential for economic growth is constrained.

4.5.2 No Action Alternative

If the proposed project is not approved, the existing (domestic) regional 138-kV transmission system could experience substantial congestion and reliability problems. In the absence of the proposed project, electric utilities in south Texas could incur RMR costs, as the existing transmission system may be inadequate under certain contingency situations. Economic benefits to both the U.S. and Mexican electrical systems, including improved service reliability and the development of markets to trade power across the border, would also not occur at this location.

4.5.3 Environmental Justice Evaluation

Step One: Disproportionate Effects Test – Census Tract Analysis

The EJ Effects Area exhibits a disproportionately high percentage of ethnic minorities because over 50% of the population is classified as minority. Data for the nearby cities of McAllen and Mission, Hidalgo County, and the State of Texas were used for comparison purposes.

As shown in Table 3-5, the EJ Effects Area has a total minority population of 89.6%, which is a higher rate than the cities of McAllen and Mission and the State of Texas, and slightly higher than Hidalgo County. There are no Native American communities located within the study area.

The EJ Effects Area also contains a disproportionate number of low-income residents (38.4%) when compared to the cities of Mission and McAllen, and the State of Texas. The percentage of low-income residents is only slightly higher than that of Hidalgo County. This level is sufficient to trigger an analysis of potential disproportionate environmental or human health impacts to this population.

Step 2 – Evaluation of Findings of the Disproportionate Effects Test

The determination of whether disproportionately high and adverse human health or environmental effects would impact the minority and low-income populations within the EJ effects Area was based on the determination of potential impacts addressed in this EA. Since the EA has found no verifiable adverse human health effects will likely result from the construction or operation of this project, there will be no such effects on either the minority or low-income populations addressed. Likewise, since there will be no significant, adverse impacts to the ecological, cultural, human, economic, or social environments within the EJ Effects Area, and only minor and temporary impacts within or adjacent to the actual ROW (which

is generally unpopulated), there will be no significant adverse environmental effects to either of these two populations, as described in EO 12898. Because no disproportionately high and adverse human health or environmental effects to low-income and minority populations living in the study area was found, steps 3 through 5 are not necessary.

4.6 IMPACTS ON LAND USE, AESTHETICS AND RECREATION

4.6.1 Land Use

Land use impacts from transmission line construction are usually determined by the amount of land (of whatever use) displaced by the actual ROW and by the compatibility of electric transmission line ROW with adjacent land uses. During construction, temporary impacts to land uses within the ROW could occur due to the movement of workers and materials through the area. Construction noise and dust, as well as temporary disruption of traffic flow, could also temporarily affect residents and businesses in the area immediately adjacent to the ROW. Coordination between Sharyland, contractors, and landowners regarding access to the ROW and construction scheduling could minimize these disruptions.

The primary criteria considered to measure potential land use impacts for this project included proximity to habitable structures (i.e., residences, businesses, schools, churches, hospitals, nursing homes, etc.), overall length, length using or paralleling existing transmission line ROW, and length parallel to other existing ROW (roads, utilities, canals, etc.).

One of the more important measures of potential land use impacts is the number of habitable structures located within the vicinity of each route. The number of, and distance to, habitable structures along each route was determined by evaluating and measuring aerial photographs and ground-truthing that information in the field, where possible.

The least impact to land use generally results from locating new lines either within, or parallel to, existing transmission line ROW. However, when existing transmission line ROW is not available, paralleling other existing compatible ROW is also generally considered a positive routing criteria.

Agriculture comprises a good portion of the land use within the study area and along alternative routes A and B. Potential impacts to agricultural land uses include the disruption or preemption of agricultural activities. Disruption includes the time lost going around or backing up to structures in order to cultivate as much area as possible and the general loss of efficiency compared to plowing or planting unimpeded in straight rows. Preemption of agricultural activities refers to the actual amount of land lost to production around the base of the structure. Construction activities associated with the proposed project could slightly impact agricultural production, depending on the timing of activities. However, due to the relatively small area affected and the short duration of construction activities, agricultural impacts would be minor.

Since the ROW for this project would not be fenced or otherwise separated from adjacent lands, there would be no long-term or significant displacement of farming or grazing activities. Most existing agricultural land uses could be resumed following construction. No crop or pasture land irrigated by circle-pivot or other above-ground mechanical means would be crossed by routes A or B.

Finally, the overall length of a particular alternative route can be an indicator of the relative level of land use impacts. That is, generally (all other things being approximately equal), the shorter the route, the less land is crossed and the fewer potential impacts would result.

4.6.1.1 No Action Alternative

Under this alternative, current land use practices would continue. Any land use impacts as a result of the project would not occur.

4.6.1.2 Applicant's Preferred Alternative (Route A)

For this project, although Route A lies within 91.4 m (300 ft) of a greater number of habitable structures (11), it is the shorter of the two alternatives (1,356.4 m, or 4,450 ft), parallels a greater amount (987.6 m, or 3,240 ft) of existing ROW (the Old Edinburg Canal), and does not cross any cultivated cropland.

4.6.1.3 Route B

Route B lies within 91.4 m (300 ft) of fewer habitable structures (4), but is the longer of the alternatives (1,905 m, or 6,250 ft), parallels less existing ROW (591.3 m, or 1,940 ft), and crosses approximately 554.7 m (1,820 ft) of cultivated cropland.

Neither of the alternative routes would affect any local, state, or federal land use plans. Both of the alternatives are located within the Mission City Limits; however, neither would conflict with future land use as defined in the Mission Comprehensive Plan. The study area lies in the southwestern portion of the master planned community of Sharyland Plantation. Any potential conflicts between the proposed project and the master plan for Sharyland Plantation would be resolved between the developer and the utility.

4.6.2 Aesthetics

Aesthetic impacts, or impacts on visual resources, exist when the ROW, lines and/or structures of a transmission line system, create an intrusion into, or substantially alter the character of the existing view. The significance of the impact is directly related to the quality of the view, in the case of natural scenic areas, or to the importance of the existing setting in the use and/or enjoyment of an area, in the case of valued community resources and recreational areas.

Construction of the proposed 138-kV transmission line could have both temporary and permanent aesthetic effects. Temporary impacts would include views of the actual assembly and erection of the

structures and clearing of the ROW. Where wooded areas are cleared, the brush and wood debris could have a temporary negative impact on the local visual environment. Permanent impacts from the project would involve the views of the structures and lines as well as views of cleared ROW.

As stated in Section 3.8.2, the study area exhibits a generally low to moderate level of aesthetic quality in an area that presents an intensive level of landscape modification due to agricultural, commercial, and residential development. However, both routes A and B would be visible from FM 1016, which comprises a portion of TxDOT's "Tropical Trail." Additionally, La Lomita Historical Park (which includes La Lomita Chapel), a designated attraction along the Tropical Trail, and St. Peter's Novitiate (within the La Lomita Historic District), are both located in close proximity to the proposed routes (potential visual impacts to these areas are discussed in more detail in Section 4.7 of this document). Other recreational areas that are located within close proximity to the routes include Time Out Campgrounds, the LRGV NWR, and Chimney Park.

4.6.2.1 No Action Alternative

The aesthetics of the study area under this alternative could arguably be affected by any type of development in the area. Aesthetic impacts from the proposed project would not occur.

4.6.2.2 Applicant's Preferred Alternative (Route A)

Route A would be less visible from recreational areas when compared to Route B. Approximately 2,350 ft of Route A would fall within the foreground visual zone (0.8 km, or 0.5 mile) of the Time Out Campground, and an additional 685.8 m (2,250 ft) would be visible from Chimney Park. No portion of Route A would be within the foreground zone of La Lomita Historical Park or the LRGV NWR. Approximately 914.4 m (3,000 ft) of Route A would be within the foreground zone of the Tropical Trail (FM 1016). Potential visual impacts to the La Lomita Historic District are discussed in Section 4.7.2 of this report.

4.6.2.3 Route B

Route B is located approximately 76.2 m (250 ft) north of La Lomita Historical Park, and therefore approximately 1,371.6 m (4,500 ft) of this alternative would be within the foreground visual zone of the park. Additionally, Route B would also fall within the foreground visual zone of Time Out Campgrounds (1,371.6 m, or 4,500 ft) and the LRGV NWR (approximately 1,082 m, or 3,550 ft). Approximately 1,219.2 m (4,000 ft) of Route B would be within the foreground zone of the Tropical Trail (FM 1016). Potential visual impacts to the La Lomita Historic District are discussed in Section 4.7.2 of this report.

4.6.3 Recreation

4.6.3.1 No Action Alternative

Potential effects on recreation in the study area as a result of the proposed project would not occur.

4.6.3.2 Applicant's Preferred Alternative (Route A)

Route A would not cross or directly impact any existing public or private park or recreation area. This alternative, however, is located within 304.8 m (1,000 ft) of the Time Out Campgrounds and the Chimney Park RV Resort. Because Route A is not located within any portion of these park boundaries, there would be no interference with any potential recreational activities.

Additionally, the TPWD considers the Rio Grande to be a permanently floatable waterway within the study area as well as a regional attraction. However, recreational use of the Rio Grande is limited by the lack of public access points or other recreation facilities. The proposed transmission line would span the entire surface area of the river and not likely interfere with any river-related recreational activities.

4.6.3.3 Route B

Route B would also not cross or directly impact any existing public or private park or recreation area. However, Route B would pass within 304.8 m (1,000 ft) of the Time Out Campgrounds, the La Lomita Historical Park, and a tract of the LRGV NWR. However, because this alternative is not located within any portion of park boundaries, there would be no interference with any potential recreational activities.

Additionally, the TPWD considers the Rio Grande to be a permanently floatable waterway within the study area as well as a regional attraction. However, recreational use of the Rio Grande is limited by the lack of public access points or other recreation facilities. The proposed transmission line would span the entire surface area of the river and not likely interfere with any river-related recreational activities.

4.6.4 Aviation/Transportation

4.6.4.1 No Action Alternative

Any potential effects on aviation/transportation in the study area as a result of the proposed project would not occur.

4.6.4.2 Applicant's Preferred Alternative (Route A)

The proposed transmission line facilities would have only a minimal effect on aviation operations within the study area. Structure heights would average approximately 26 m (85 ft), depending upon structure design and location. According to Federal Aviation Regulations (FAR), Part 77, notification of the

construction of the proposed transmission line would be required if structure heights exceed the height of an imaginary surface extending outward and upward at a slope of 100 to 1 for a horizontal distance of 6,096 m (20,000 ft) from the nearest point of the nearest runway of a public or military airport having at least one runway longer than 975.4 m (3,200 ft). If a runway is less than 975.4 m (3,200 ft), notification is required if structure heights exceed the height of an imaginary surface extending outward and upward at a slope of 50 to 1, for a distance of 3,048 m (10,000 ft). There are no public, private, or military airfields within 6,096 m (20,000 ft) of Route A and, therefore, FAA notification would not be required for the applicant's preferred alternative.

The use of aircraft in support of farming activities is widespread throughout the Lower Rio Grande Valley, including portions of the study area. Airplanes are used for fertilizing and the application of pesticides and herbicides. The necessities of agricultural aviation generally require aircraft to operate at very low altitudes and thus, the location of transmission lines could potentially impact these operations. Route A crosses no farmland and thus, should pose no direct problem to these operations. The route is adjacent to several agricultural fields, however, so there could be some concerns. Hunt Development, developers of Sharyland, owns all of the tracts currently used for cropland and has plans to develop each into non-agricultural uses, thus eventually eliminating potential conflict.

Potential impacts to transportation could include disruption of traffic and conflicts with proposed roadway and/or utility improvements, and may include increased traffic during construction of the proposed project. The project would generate only minor construction traffic. This traffic would consist of construction employee's personal vehicles, truck traffic for material deliveries, and concrete trucks for structure foundation work. At the peak of construction, it is estimated the project would generate no more than 40 vehicles per day (compared to ADTs of 5,000–8,000 on study area roads). These impacts are usually temporary and short-term. Because Route A crosses FM 1016, Sharyland would be required to obtain a road-crossing permit from TxDOT.

The proposed transmission line would have a minimal effect on communication operations in the area. No AM/FM radio transmitters were identified within the study area. Additionally, no electronic communications towers are located within 609.6 m (2,000 ft) of the applicant's preferred alternative.

4.6.4.3 Route B

The proposed transmission line facilities along Route B would also have only a minimal effect on aviation operations within the study area (see discussion in Section 4.6.4.2 above). There are no public, private, or military airfields within 6,096 m (20,000 ft) of Route B and, therefore, FAA notification would not be required for this route.

Route B crosses two small, isolated agricultural fields, so there could potentially be some conflicts with aerial spraying. However, these activities have coexisted with numerous and increasing numbers of both distribution and transmission lines for decades throughout the valley. In addition, Hunt Development,

developers of Sharyland, owns both tracts and plans to develop each into non-agricultural uses, thus eventually eliminating potential conflict.

Potential impacts to transportation could include disruption of traffic and conflicts with proposed roadway and/or utility improvements, and may include increased traffic during construction of the proposed project. The project would likely generate only minor construction traffic. This traffic would consist of construction employee's personal vehicles, truck traffic for material deliveries, and concrete trucks for structure foundation work. At the peak of construction, it is estimated the project would generate no more than 40 vehicles per day (compared to ADTs of 5,000–8,000 on study area roads). These impacts are usually temporary and short-term. Because Route B crosses FM 1016 and FM 494, Sharyland will be required to obtain road-crossing permits from TxDOT for this alternative.

The proposed transmission line would have a minimal effect on communication operations in the area. No AM/FM radio transmitters were identified within the study area. Additionally, no electronic communications towers are located within 609.6 m (2,000 ft) of Route B.

4.7 IMPACTS ON CULTURAL RESOURCES

This project's requirement of a Presidential Permit and regulatory review by the DOE triggers cultural resource management requirements under NEPA and the NHPA. Both of these laws require that the lead federal agency, the DOE, consider potential impacts to significant cultural resources before the project is approved for construction. Specific cultural resource management requirements are defined under Section 106 of the NHPA, as amended.

Section 106 requires that a good-faith effort be conducted to identify all significant historic (meaning National Register eligible) cultural properties within the project's area of potential effect. Archaeologically, the area of potential effect is usually limited to the ROW within which construction-related activities occur. This is the area within which direct effects may occur to resources located within the ROW. However, Section 106 further requires that possible indirect effects be considered for historical resources in close proximity to the proposed alternative routes. In this sense, the area of potential effect for non-archaeological resources includes the area within a variable visual range surrounding a transmission line project. This type of indirect effect can become adverse when the historical value of an affected resource depends on the visual historical integrity of its setting or visible surroundings. Other types of indirect affects (e.g. noise, vibration, or air quality) are not typically a matter of concern for transmission line projects. Analysis of the direct and indirect effects of the project upon identified cultural resources is presented as follows.

4.7.1 Archaeological Impact Assessment

During the alternatives analysis for this project, archaeological survey data was lacking for the study area. To address this deficiency, a preliminary assessment of archaeological resource potential was developed

for each alternative by identifying archaeological HPA along the ROW of each proposed route. This method took into account topographic setting, environment, availability of raw materials, water, and subsistence resources, as well as historical maps for each route. Most of the study area occurs within an expansive alluvial floodplain, the type of setting that favors deposition and burial of intact archaeological sites and thus qualifies as a HPA. The routes were compared and the amount of HPA was used in selection of a preferred alternative. Summary assessments for each of the alternative routes is presented below.

4.7.1.1 No Action Alternative

Under the No Action Alternative, cultural resources will not be directly affected by construction but such resources would be subject to continued developmental alterations occurring across the study area.

4.7.1.2 Applicant's Preferred Alternative (Route A)

No cultural resource sites are currently recorded within the ROW of Route A, nor are any recorded within 304.8 m (1,000 ft) of the ROW. However, the entire length of Route A, 1,356 m (4,448 ft), is considered a HPA for unrecorded archaeological resources. The area within the Rio Grande's natural floodplain is a likely location for deeply buried archaeological sites. The area away from the floodplain has a high probability for containing surficial or shallowly buried archaeological sites. Consequently, the entire length of Route A presents a high likelihood for impacts to archaeological resource sites. Archaeologists would monitor construction in the area near the Rio Grande, especially the excavation for structures. If previously undiscovered cultural resources are found elsewhere on the project, work at that location would be temporarily suspended and the SHPO consulted before proceeding. To avoid impacting shallowly buried sites along the ROW, traffic would be restricted to only those vehicles necessary for construction. Off-site parking areas would be designated for construction worker's vehicles.

4.7.1.3 Route B

No cultural resource sites are currently recorded within the ROW of Route B, nor are any recorded within 304.8 m (1,000 feet) of the ROW The entire length of Route B, 1,904 m (6,245 ft), is also considered to have a high probability for the presence of unrecorded archaeological sites. Again, like Route A, the area within the Rio Grande's natural floodplain has the potential to contain deeply buried sites, while the area outside of the floodplain is likely to contain surficial or shallowly buried sites. Therefore, Route B is also considered to have a high potential for impacts to unrecorded cultural resource sites, but to a greater extent, as a result of its greater length of HPA.

4.7.2 Historical/Non-Archaeological Resource Impacts

The area of potential effect for non-archaeological historic resources includes the area within a variable visual range surrounding the proposed transmission line project. Because significant historical resources

have been identified within and near the study area through previous resource identification and assessment efforts, the known resources were examined by a historian with specialized expertise in assessing effects in accordance with Section 106 and Secretary of the Interior standards. Attention was paid to the overall visual historic integrity of the study area as well as visible non-historic alterations or intrusions within the view shed surrounding the known historic resources. Other types of indirect affects (e.g. noise, vibration, or air quality) were not given as much consideration because such effects are not usually caused by transmission line projects. Analysis of the project's effects upon known non-archaeological historic resources is presented as follows.

4.7.2.1 No Action Alternative

Under the No Action Alternative, no historic resources would be visually affected, but impacts to such resources would continue to occur as a result of the ongoing patterns of general development in the area.

4.7.2.2 Applicant's Preferred Alternative (Route A)

Adverse visual impacts to historic resources are unlikely to occur in connection with Route A because rapid development in and around this route has already changed the historical setting that existed across the area 50 or more years ago. While the nearby community of Madero may contain historic buildings never before assessed for historical significance, the altered visual setting surrounding the community's buildings would not likely be a favorable factor in any future determinations of National Register eligibility. The immediate setting of the Old Edinburg Canal irrigation canal that occurs within the study area would be highly affected by the preferred alternative. However, the individual historical significance of this segment of canal is limited, and the resource type is better represented by the 43,000-ac system listed in the National Register as the Louisiana-Rio Grande Canal Company, currently operated by Hidalgo County Water District No. 2, which would be unaffected by the project.

The most well known historic resource in the APE is the La Lomita Historic District. Its nearest boundary is located approximately 490 m (1,607 ft) from Route A, but its original rural agricultural setting has been affected by changes in land use and other visible alterations to the surrounding landscape. Within the viewshed of La Lomita, a small railway crossed by Route A was once part of the "Spiderweb Railway." Its tracks and signs have been replaced, thereby limiting its individual historical integrity and the setting around it.

Route B

Indirect visual impacts to significant cultural resources are more likely to occur for Route B than Route A because this route is much closer to the La Lomita Historic District. Route B is located less than 33 m (108 ft) from the nearest district boundary, thus it would be highly visible from the district and its significant historic buildings. Such an impact is probably non-adverse because rapid, ongoing development in and around this route has already changed to a great extent the mission's historical setting

that existed 50 or more years ago. Recent development has similarly altered the physical integrity and historical setting of the "Spiderweb Railway," and the early 20th century irrigation canals that occur within the study area

4.7.3 Summary of Cultural Resources Impacts Analysis

In the absence of complete archaeological survey information for the study area, the survey area's potential for impacts to archaeological resources was first assessed by analysis of archaeological HPAs. Topographic setting, environment, the availability of raw material, water, and subsistence resources, as well as historical maps, were all taken into consideration in the HPA assessments. The two build alternatives, Route A and Route B, were then compared in terms of their length of HPA. Route A is 1,356 m (4,448 ft) long and the entire route was considered HPA. Route B is 1,904 m (6,245 ft) long and the entirety of this route also was considered HPA. For both routes, the area within the Rio Grande's natural floodplain has the potential to contain deeply buried sites, while the area outside of the floodplain would likely contain surficial or shallowly buried sites.

A simple comparison of the archaeological site potential for these two alternatives favors Route A. This route contains substantially less HPA than Route B. In addition, a cultural resources survey of the applicant's preferred route, Route A, was performed on October 20, 2003. Given the negative results of shovel testing along the proposed ROW, and the degree of landscape modification, it is unlikely that shallow prehistoric deposits remain intact within the ROW, further reducing the area of concern for archaeological impacts along this route. Rather than conduct deep mechanical survey at all impact locations in the deep floodplain soils along the river, which would cause more extensive impacts to deeply buried sites, if any are present, archaeological monitoring of proposed pole locations 1, 2, and 3 was recommended. SHPO concurred with this recommendation. The complete results of this survey are presented in a report contained in Appendix B of this document.

As noted in Section 3.9.2 of this document, a review of official listings of recorded historic properties within Hidalgo County identified one National Register-listed property, La Lomita Historic District, in the study area. A brief visit to the district was conducted by an architectural historian to verify the existing condition of the district and its surroundings. Despite a variety of modern alterations to the setting in and around the district, both of the church buildings retain a high degree of individual integrity and, therefore, continue to maintain their architectural and historical importance to the local area. However, alterations to the original rural agricultural environment diminish the historical integrity of the setting beyond the district boundaries. Ongoing patterns of residential, commercial, and industrial redevelopment across the study area since the mid-twentieth century have further diminished the integrity of other historic age resources in the area, such as the Madero Community, the Spiderweb Railroad, and the Old Edinburg Canal. The balance of cultural resource factors considered favors selection and construction of the Applicant's Preferred Alternative, Route A, with the understanding that archaeological

monitoring would be conducted at proposed pole locations 1, 2 and 3 along the river terrace portion of the route.

4.7.4 Mitigation (All Alternative Routes)

Mitigation is required when a significant (National Register listed or eligible) historic resource is adversely affected by a project. The preferred method is avoidance through careful route selection or redesign. In this sense, the route selection process provided a level of analysis and consideration that mitigated possible effects to cultural resources in the study area. Alternative forms of mitigation could include detailed historical documentation for historical sites, data retrieval for archaeological sites, relocation of historic buildings, or planting of visual screening elements, depending on the type and extent of the impact upon the resource. In terms of historic resources, Route A, the Applicant's Preferred Alternative, presents less impact to the La Lomita Historic District because its visibility will be less than of Route B. However, neither Route A or Route B are likely to cause adverse effects to significant historic resources as defined under Section 106 of the NHPA. Consequently, formal agreements to define mitigative procedures and treatments are not necessary for either alternative route. However, in terms of archaeological resources, a preemptive mitigative requirement has been recommended and approved by SHPO. During construction, archaeological monitoring would be conducted at Pole Locations 1, 2, and 3, as indicated in Appendix B, to minimize disturbance and record evidence of deeply buried archaeological resources, if any exist, in the floodplain spoils near the river.

4.8 ELECTRIC AND MAGNETIC FIELDS

Sharyland's proposed transmission line would be a single-circuit, 138-kV line constructed on wood, concrete, or steel single-pole structures within a 30.5-m (100-ft) wide ROW. The line would be designed to carry a sustained load of 300 MVA (300,000 kVA).

Any device which transmits, distributes, or uses electric power produces electric and magnetic fields (EMFs). As discussed below, extensive research has not revealed any conclusive evidence that magnetic fields from powerlines pose a hazard to animal or human health.

The electric field from a transmission or distribution line is a function of the voltage of the line. Because the voltage of a line is essentially constant over time, the magnitude of the electric field remains constant regardless of the amount of the load on the line. Electric fields are grounded by large objects such as trees and buildings.

The level of the magnetic field produced by an electric transmission line depends on the electrical load, the configuration of the conductors (spacing and orientation), the height of the conductors, the distance from the line, the electrical load on the line, and the proximity of other electrical lines. The load on a transmission line varies continually on a daily and seasonal basis. The magnetic fields likewise vary throughout the year and during the day.

Extensive research has been conducted to determine whether electric or magnetic fields may cause or promote adverse health effects. This research continues, including studies funded by the United States Government. In recent years, the main emphasis has been on magnetic fields. Electrical fields were studied in previous years, and were not found to be a concern for levels typical of powerlines. Independent reviews of the literature on potential health effects are consistent; research has not revealed any conclusive evidence that magnetic fields from powerlines pose a hazard to animal or human health.

One of these studies is the report by the National Research Council (National Research Council, 1997). The National Research Council consists of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The committee reached the following conclusion regarding the potential health effects of EMFs:

> "Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects."

This conclusion is consistent with other reviews of the scientific literature, including ones by the Oak Ridge Associated Universities (1992), the American Medical Association (Council on Scientific Affairs, 1994), the American Physical Society (Hafemeister, 1995), and the American Cancer Society (Heath, 1996). These conclusions are also consistent with the findings of a previous study prepared for the Public Utility Commission of Texas entitled, *Health Effects of Exposure to Powerline-Frequency Electric and Magnetic Fields*. That study stated that ". . . the evidence at this time is insufficient to conclude that exposure to EMF from electric power transmission lines poses an imminent or major public health risk." (PUC, 1992).

Other studies completed since the mid-1990s have not shown a strong correlation between electric and/or magnetic fields and the future development of cancers. A voluminous amount of data is available in printed and electronic formats concerning epidemiologic studies undertaken to address this subject. Two sources of information that are fairly detailed, yet easy to navigate, are websites for the World Health Organization's "International EMF Project" (www.who.int/peh-emf/en/), and the Medical College of Wisconsin's "Electromagnetic Fields and Human Health" (www.mcw.edu/gcrc/cop/powerlines-cancer-FAQ/toc.html).

The proposed transmission line would generate EMFs. Additional measures would be implemented to ensure that the field strengths are minimized outside of the transmission line ROW. Notably, conductors would be designed to be in a "delta-shaped" configuration, and the minimum conductor height above ground would be approximately 8.5 m (28 ft), with a ROW width of approximately 30.5 m (100 ft). The

"delta-shaped" configuration has been recommended, as it ensures that the mutual magnetic fields are minimized within the structure itself, thereby reducing external magnetic fields. The minimum conductor height of 8.5 m (28 ft) is greater than the minimum allowed by existing electric codes to increase the distance from field generating conductors and nearby structures. The ROW width of 30.5 m (100 ft) would maintain a minimum distance of 12.2 m (40 ft) from field generating conductors to structures which might be constructed at the edge of the ROW in the future. These factors have been comparatively evaluated to minimize EMFs at the edge of the ROW while being economically justifiable. The maximum EMFs have been calculated to be 1.17 kilovolts per meter (kV/m) and 26.3 milligauss (mG) at the edge of the ROW, respectively.

Project economics would also be re-evaluated when final design parameters are established to confirm the most economical minimum height of conductors and ROW width are utilized to minimize the field strengths at the edge of the ROW. Where possible, minimum design conductor height and ROW width would be increased.

The effect of powerline EMF upon living organisms continues to be studied worldwide and advances in techniques to minimize impacts of EMF are expected to result from these studies. Any information concerning the mitigation of EMF that becomes available prior to the construction of the proposed project would be incorporated into the final routing and design.

Efforts to reduce corona discharge (e.g., ensuring tight, unscratched hardware) should result in no noticeable ozone production and, thus, no effects are expected. Radio and television interference may also result from corona discharges. The level of AM radio and television interference depends upon a number of factors including voltage, conductor diameter, number of conductors per phase, phase spacing, conductor height, conductor surface factor, relative air density (humidity), and wind speed. Of greatest importance are conductor diameter and configuration and conductor surface factor. Hardware would be designed to reduce radio noise. Excessive AM radio interference is uncommon from 138-kV lines. However, should radio interference become a problem due to equipment defects, such defects would be addressed. Television interference (in the low VHF bands) may occur, especially if the signal is weak and the antenna is directional and too close to the transmission line. Complaints would be checked and problems corrected if determined to be caused by the transmission line.

Any noticeable voltage induced in fences, gates, and other metal objects beneath the line is not anticipated. None of the agricultural lands crossed by the alternative transmission line routes were observed to use either fixed or portable irrigation systems. Voltages induced in conducting bodies adjacent to transmission lines are proportional to line voltage, distance, and conductor length.

4.9 TRANSBOUNDARY IMPACTS

In July 1997, the Council on Environmental Quality (CEQ) issued a guidance pertaining to NEPA requirements for analysis and disclosure of transboundary impacts (impacts across an international

border) of proposed federal actions taking place in the U.S. This guidance determined that federal agencies must include a description of reasonably foreseeable transboundary effects of proposed actions in the U.S. in their analysis.

CFE has prepared a document that describes the project on the Mexican side of the border and includes information on the prevention of environmental impacts related to the proposed project. This document will be provided to the DOE to assist in their compliance with the CEQ requirements.

4.10 MITIGATION

The proposed Sharyland Mexico Tie Project would be constructed as a single-circuit, 138-kV line, on wood, concrete, or steel single-pole structures.

The following is a summary of measures that Sharyland proposes to undertake to mitigate the effects of the construction and operation of the proposed transmission line:

- Efforts would be made during construction for proper control and handling of any petroleum or other chemical products used.
- Appropriate erosion-control measures would be utilized during construction of the transmission line and converter station.
- Sharyland does not propose to use herbicides for ROW maintenance. However, should woody species become a problem within the ROW and herbicide use is required, Sharyland would use only EPA-approved herbicides, and application would be made according to label directions.
- With the permission of the landowner, cleared or trimmed woody vegetation may be stacked outside the ROW to enhance habitat for some wildlife species.
- Construction within the ROW would be performed in such a manner as to minimize adverse impacts to vegetation adjacent to the ROW.
- All work in agricultural fields would be conducted in dry weather with rubber-tired vehicles.
- Sharyland has taken into account archaeological and historical resources in the selection and evaluation of alternative routes. If cultural resources consultation is required during any future permitting activities for this project, Sharyland would coordinate with the SHPO. If any cultural resource sites are discovered during construction, they would be reported to the SHPO.
- The transmission line would be designed to reduce audible noise, ozone production, and radio/television interference.

- The clean-up operation would involve the removal of debris and the restoration of items damaged by the construction of the project as required. Sharyland would assure that affected areas are restored as close to the original condition as practical. All unavoidable damage claims would be resolved by Sharyland's ROW contractor.

- Archaeological monitoring of construction would be conducted in areas of high archaeological potential at poles 1, 2, and 3, to record any cultural materials displaced from deeply buried contexts. If human skeletal remains are encountered, construction in the vicinity would be stopped and the SHPO contacted for further direction.

Table 4-1 provides a summary of impacts for each resource category (e.g., vegetation, wildlife, etc.) that would result from the three alternatives (No Action, Proposed Action, and Alternate Action).

TABLE 4-1
SUMMARY OF ALTERNATIVES IMPACTS

Resource Category	No-Action Alternative	Proposed Action (Route A)	Alternate Action (Route B)
Geology/Soils	No impacts would result from the project. Changes to the soil would be limited to biological processes and changes in land use practices. Soil productivity would be affected naturally through leaching and weathering, but the effects would be negligible.	Construction-related erosion and compaction could occur but only very small areas (37.4 sq m or 402.4 sq ft) immediately beneath the structures would be unavailable for use. No prime farmland soils would be removed from crop production. The area of soil to be removed from potential production would be restricted to the area physically occupied by the structures plus any additional area removed from production as a result of limited access by farm equipment around the base of structures. The 2.8-ha (7-ac) converter station site would be permanently removed from crop production.	The general impacts would be similar to Route A except that Route B is longer and crosses approximately 1,691.6 m (5,550 ft) of prime farmland soils (including 563.9 m (1,850 ft) of land currently used as cropland). Impacts resulting from soil compaction, erosion, and loss of productivity would be greater than those from Route A, the bases of the structures taking up approximately 46.7 sq m, or 503 sq ft.
Water	No impacts would result from the project. Changes would be limited to biological and natural processes. Sedimentation as a result of soil disturbance through agricultural practices and natural erosion would continue. Effects would be negligible.	Route A would have less potential impact from pollution resulting from erosion or the accidental spillage of petroleum or other chemicals, than Route B. Route A would cross the lesser amount of 100-year floodplain (approximately 198.1 m, or 650 ft) and, therefore, would have less potential impact. It also crosses less open water (river and canal), approximately 94.5 m (310 ft).	Route B is approximately 1.3 times longer than Route A and thus would have more potential for impacts. It would cross more 100-year floodplain and open water (river and canal), approximately 457.2 m (1,500 ft) of 100-year floodplain and 155.5 m (510 ft) of open water.
Vegetation	No impacts would result from the project. Species composition would continue to change slowly as a result of natural succession and from natural occurrences. Species composition would change more rapidly through agricultural practices and urban/suburban development.	Route A would require little clearing of vegetation (crossing no brushland/woodland). The Rio Grande would be spanned without placing structures in the jurisdictional area, thus minimizing potential impacts.	Route B would require more vegetation clearing than Route A (crossing approximately 73.2 m (240 ft) of brushland/ woodland). Potential impacts to the Rio Grande would be similar to that of Route A.

TABLE 4-1 (CONT'D)

Resource Category	No-Action Alternative	Proposed Action (Route A)	Alternate Action (Route B)
Wildlife	No impact would result from the project. Impacts would be limited to biological changes and changes resulting from continued agricultural and other land use practices. Any brush clearing that took place as a result of these activities would reduce habitat for certain species. Effects would be negligible.	Route A traverses no brushland, woodland, or riparian habitats. Route A crosses approximately 94.5 m (310 ft) of open water; however, these areas would be spanned. Route A represents less potential impact for avian mortality through wire strikes than Route B because it is the shorter route (1,356.4 m or 4,450 ft). No impacts to endangered species are expected.	Route B crosses approximately 73.2 m (240 ft) of brushland/woodland and 155.5 m (510 ft) of open water. Route B, being approximately 1,905 m (6,250 ft) in length, has a greater potential than Route A for avian wirestrikes. No impacts to endangered species are expected.
Aquatic Ecosystems	No impacts would result from the project. Changes would be limited to biological and natural processes. Sedimentation as a result of soil disturbance through agricultural practices, including vegetation removal in riparian areas, would continue. Effects would be negligible.	No potential wetlands would be crossed. Route A would cross approximately 94.5 m (310 ft) of open water (river and canal); however, these areas would all be spanned.	No potential wetlands would be crossed. Route B would cross approximately 155.5 m (510 ft) of open water (river and canal); however, these areas would all be spanned. Route B has a greater potential than Route A for sedimentation resulting from soil disturbance because it is the longer route.
Socioeconomics	If the proposed project is not constructed, benefits to both the U.S. and Mexican electrical systems, including improved service reliability and the development of markets to trade power across the border, would not occur at this location.	Benefits to both the U.S. and Mexican electrical systems, including improved service reliability and the development of markets to trade power across the border, would occur at this location.	Benefits to both the U.S. and Mexican electrical systems, including improved service reliability and the development of markets to trade power across the border, would occur at this location
Land Use	No impacts would result from the project. Current land use practices would continue.	Although Route A lies within 91.4 m (300 ft) of a greater number of habitable structures (11), it is the shorter of the two alternatives (1,356.4 m, or 4,450 ft), parallels a greater amount (987.6 m, or 3,240 ft) of existing ROW (the Old Edinburg Canal), and does not cross any cultivated cropland.	Route B lies within 91.4 m (300 ft) of fewer habitable structures (4), but is the longer of the alternatives (1,905 m, or 6,250 ft), parallels less existing ROW (591.3 m, or 1,940 ft), and crosses approximately 554.7 m (1,820 ft) of cultivated cropland.

TABLE 4-1 (CONT'D)

Resource Category	No-Action Alternative	Proposed Action (Route A)	Alternate Action (Route B)
Aesthetics	No impacts would result from the project.	Route A would be less visible from recreational areas than Route B. Approximately 2,350 ft of Route A would fall within the foreground visual zone (0.8 km, or 0.5 mile) of the Time Out Campground, and an additional 685.8 m (2,250 ft) would be visible from Chimney Park. No portion of Route A would be within the foreground visual zone of La Lomita Historical Park or the LRGV NWR. Approximately 914.4 m (3,000 ft) of Route A would be within the foreground zone of the Tropical Trail (FM 1016).	Approximately 1,371.6 m (4,500 ft) of this alternative would be within the foreground visual zone of La Lomita Historical Park. Route B would also fall within the foreground visual zone of Time Out Campgrounds (1,371.6 m, or 4,500 ft) and the LRGV NWR (approximately 1,082 m, or 3,550 ft). Approximately 1,219.2 m (4,000 ft) of Route B would be within the foreground visual zone of the Tropical Trail (FM 1016).
Recreation	No impacts would result from the project.	Route A would not cross or directly impact any existing public or private park or recreation area, but is located within 304.8 m (1,000 ft) of the Time Out Campgrounds and the Chimney Park RV Resort. There would be no interference, however, with any potential recreational activities. The proposed transmission line would span the Rio Grande and would not interfere with any river-related recreational activities.	Potential impacts to recreation from this alternative would be similar to those of Route A.
Aviation/Transportation	No impacts would result from the project.	Potential impacts to aviation from this alternative are expected to be less than those from Route B because it crosses no cropland. This Route is located adjacent to several agricultural fields; however, so there is some potential for conflicts with aerial spraying. Potential impacts to transportation could include disruption of traffic and conflicts with proposed roadway and/or utility improvements. Increased traffic may occur during construction; however, this would be minor and short-term.	Route B crosses two small, agricultural fields, so there is the potential for conflicts with aerial spraying. Generally, transportation impacts from this alternative are similar to those of Route A. Route B crosses FM 1016 and FM 494, requiring Sharyland to obtain road-crossing permits from TxDOT.

TABLE 4-1 (CONT'D)

Resource Category	No-Action Alternative	Proposed Action (Route A)	Alternate Action (Route B)
Cultural Resources	No impacts would result from the project.	Although the entire length of Route A; 1,356 m (4,448 ft), is considered a HPA for unrecorded archaeological resources, a pedestrian cultural resources survey found no sites and the SHPO concurred with the survey results. The area within the Rio Grande's natural floodplain is a likely location for deeply buried archaeological sites and so an archaeologist will monitor construction in the Rio Grande floodplain and if cultural resources are discovered, the SHPO will be consulted.	The entire length of Route B, 1,904 m (6,245 ft), is considered to have a high probability for the presence of unrecorded archaeological sites. The area within the Rio Grande's natural floodplain has the potential to contain deeply buried sites, while the area outside of the floodplain is likely to contain surficial or shallowly buried sites. Route B is considered to have a greater potential for impacts to unrecorded cultural resource sites than Route A because of its greater length of HPA.
Historic Resources	No impacts would result from the project.	Adverse visual impacts to historic resources are unlikely to occur in connection with Route A because rapid development in and around this route has already changed the historical setting that existed across the area 50 or more years ago.	Indirect visual impacts to significant cultural resources are more likely to occur for Route B than Route A because this route is much closer to the La Lomita Historic District and Park (33 m (108 ft)) from the nearest district boundary, making it highly visible from the significant historic buildings of that District. These potential impacts; however, are not likely to be significant because of the extent of development that is proposed and development that has already occurred in the vicinity of this route.